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Global trends in education: Russia case study

Gurban I.A.* Tarasyev A.A., Jr.**

** Ural Federal University named after the first President of Russia B. N. Yeltsin, Russian Federation, Yekaterinburg, Research Laboratory on the problems of the university development; Institute of Economics of the Ural branch of the Russian Academy of Sciences, Center for Economic Security (e-mail: alextarassiev@mail.ru)*

*** Ural Federal University named after the first President of Russia B. N. Yeltsin, Russian Federation, Yekaterinburg, Research Laboratory on the problems of the university development; Institute of Economics of the Ural branch of the Russian Academy of Sciences, Center for Economic Security (e-mail: inessagurban@gmail.com)*

Abstract: An improved system of Russian vocational education is seen as a major factor in the country's economic development. It is currently recognized that the global labour market is emerging as a consequence of globalization processes, which significantly affect the establishment of national educational systems. The paper discusses global educational trends, with a particular focus on the tendencies in the demand for labour both in Russia and in the world. The paper aims to describe changes in attitudes towards the relevance of specialist qualifications and the sufficiency of professional competencies acquired through education. In addition, the analysis of structural changes in the Russian system of vocational education starting from 1990 to the present day is given. The research is carried out using the methods of comparative and statistical analysis. The competency maps of future are drawn (Institute for the Future, Palo Alto, the USA), including the description of trends that alter the habitual context for the labour force, as well as key skills needed for a successful career. The 'Atlas of New Professions' describing most promising professions in the field of education is reviewed. It is shown that the country's role in the international division of labour can be used as an objective criterion to assess the performance of the country's educational system. In this respect, the data on Russia's position in the world rankings of competitiveness, innovation development and human development index, as well as the comparative data on the rate that Russian companies demonstrate in terms of innovative activity and technology exports are provided. The analysis of disproportions in the structure of graduates both in terms of levels and specialities of vocational education for the period 1990 – 2013 is given. Key problems faced by the Russian vocational education system are considered, including a weak focus on the actual needs of national economy and global changes in the labour market, a decline in the quality of training and the number of working specialities, as well as the low flexibility of educational programs.

Keywords: globalization, professional education, global trends, trends, professions, skills, competencies, graduates, levels of education.

1. INTRODUCTION

The intensification of globalization processes and the formation of the international labour market have a significant impact on the patterns of national systems of vocational education development. The result of this process in Russia consists in a wide-ranging reform of the entire education system, the final stage of which was the adoption of the new Federal Law "On Education in the Russian Federation». This law fundamentally changed the structure of higher education in Russia, since it legislated the need to implement the basic principles of the Bologna Declaration. The purposes of Russia's accession to the Bologna process include, first of all, the support for the formation and adherence to common European educational space, and, secondly, the creation of prerequisites for changing the country's role in the international division of labour and the emergence of the possible integration into the global labour market. In the context of accession to the emerging single European educational system competitive with other global educational systems (American and Asian), we have to change the approaches to the system of national vocational education organization, orienting it to the creation of a unified, multi-level, "transparent" system of training demanded by the labour market qualified workforce (Koksharov V.A., 2014). Touching upon the new trends in vocational education, it makes sense to pay attention to the changes taking place at the request for labour (Vasilyeva A.V., Tarasyev A.A., 2014) and to take into account the transformation of the relevance and completeness of the received specialties acquired during the training of professional competences.

The negative demographic situation in Russia determines the presence of numerous labour market problems (Kuklin A. A., Naydenov A. S., Nikulina N. L., Tarasyeva T. V., 2014). The combination of high rates of labour turnover with low job turnover is an important feature of the Russian market (Tarasyev A.A., 2013). In view of the difficult socio-economic situation on the Russian labour market in recent years, it is necessary to attract the labour force from neighboring countries (Naydenov A.S., Krivenko I.A., 2013),

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in the quantity and quality required for the sustainable development of the economic system (Lutz W., Crespo Cuaresma, J., Sanderson, W., 2008). At the same time, labour migration carries a number of risks and threats for sustainable development of the host regions economic systems (Gurban I.A., Klevakin A.N., 2014). The direction of migration flows undergoes over the last decade inevitable changes depending on the socio-economic situation development in the regions of attraction (Nikonov O.I., Tarasyev A.A., 2015).

2. MAP OF PROFESSIONAL SKILLS - 2020

In 2011, the Institute for the Future, Palo Alto, USA, specializing in forecasting, published a report entitled "Skills for the Future 2020» (Future Work Skills 2020 Report, 2011). This report presents a map of professional skills (Future Work Skills 2020 Summary Map, 2011). This study was sponsored by the Phoenix Research Institute, USA, which carries out academic research in the field of training of working professionals, higher education and industry, aimed to improve learning outcomes and promote a high-skilled personnel (Gurban I.A., Sudakova A.E., 2015). The main cause of the maps development is the need to identify professional skills that will be most relevant in the technologically advanced and changing world in the coming decade.

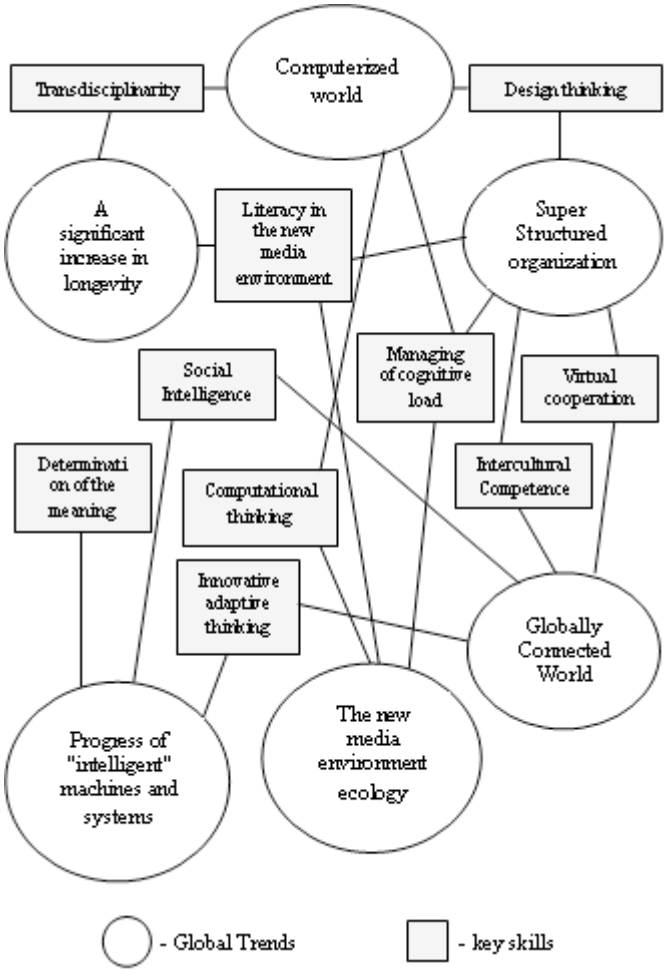

Fig. 1. Map of the skills of the future

The map illustrates six global trends, changing the usual environment for the workforce, and the corresponding ten key skills required for successful professional staff search in 2020. Thus, six global trends form the environment in which the occurrence of each skill is related to one or more of the trends (Fig. 1). The report notes, that the globally connected world, the improvement of intelligent machines and innovations in the media are just a part of the areas that are progressively changing our understanding of the working process and determine the best within the competence of the future. It also emphasizes the futility of trying to accurately predict the types of professions of the future, because of the complexity of this process, the incredible speed of technological progress and the fallacy of many previous predictions. Instead, the report focuses on job skills - the skill and abilities that will be required in the future to build a successful professional career (Koksharov, V.A., Agarkov, G.A., 2015). Let us dwell on the content of the global trends, changing habitual for workforce environment.

1. Extreme Longevity. With increasing life expectancy the population also increases. Current employees are planning to finish their career as possible later, not limiting themselves by the date of the retirement age. Usually that are professionals involved into highbrow activity. The increase of the work experience duration in conditions of the growth of techniques and technologies development require a permanent professional development, continuous improvement of existing skills and acquiring of new skills. Organizations have to find ways to transform the traditional career employees, suggesting a lot of flexibility and variability. The vector of human development is aimed at maintaining a healthy lifestyle, so that all aspects of life and, consequently, the development of the world economy, will be considered through the prism of health.

2. Computational World. The increase in processing power and the intensive development of supercomputing technology leads to the transformation of the surrounding world into a programmable system. Huge amounts of data allows to simulate the behaviour of social systems at all levels. High-performance computing will be used everywhere, ensuring management, various objects, security, solution of other industrial or households tasks. Thus, any labour activity will increasingly require the ability to effectively interact with the data.

3. Rise of Smart Machines and Systems. The process of machines and systems growing intellectualisation, their active integration into production processes is aimed at labour automation, including an increase in performance and accuracy, and the minimization of possible errors. The use of high technology in the production process transforms the human involvement in the work process, reducing it to a minimum. This process establishes new standards of work performance.

4. Superstructed Organizations. Widespread social technologies provokes the development of new forms of governance institutions, as well as the formation of the value of goods. New technologies and social media platforms allow any organization to achieve results that were previously

reached only by large corporations. New tools and technologies form new types of social, economic and political organizations, which are not limited in quantity and are not organized geographically. Open educational platforms are becoming more and more available. The new generation of organizational concepts and skills of work is not based on the traditional management and organizational theories. It is based on game design, neuroscience or psychology of happiness. These areas will stimulate the creation of new educational paradigms and tools.

5. New Media Ecology. New media technologies are transforming traditional ways of communicating, developing new communication language. The new media ecosystem formed around the complex and pervasive technologies of video production, digital animation, augmented reality, games and others. Based on the text of the Internet is gradually moving to the use of video, animation and other communication channels at the same time the virtual network more deeply penetrate into the environment, introducing new media in everyday life. Millions of users generate and view the media content that has a huge impact on the culture, raising questions about online identity, reputation, transparency levels in public and private life, the reliability of the information.

6. Globally Connected World. Globalization - the basic long-term trend, implying for the integration and exchange processes through the geographical boundaries. Today the world is globally connected and interdependent countries. Companies in the resource and infrastructure constraints emerging markets such as India or China, in some areas to innovate faster than in developed countries. The absence of aging infrastructure, coupled with rapidly growing markets stimulate high rates of growth in developing countries. Further deepening global relationships will cause the transformation of infrastructure transnational corporations in order to maintain their competitiveness.

Consider the key skills required of professional success in the future frames.

1. Sense-Making. In fact, the ability to recognize the meaning of information flow, the ability to think critically. Despite important advances in the study of artificial intelligence "smart" machines do not have the skills of thinking and apply for jobs in the field of mechanical, routine production and service, so a high level of thinking or the ability to form a sense of stand out as a skill to be a competitive advantage of man.

2. Noveland Adaptive Thinking. We are talking about the so-called "situational adaptability" - the unique ability to respond to unexpected circumstances, think outside the box, to deal effectively with non-trivial task. In the US, there is a tendency of reducing the average working qualification places (both office and associated with physical labour) in the last thirty years, mostly due to a combination of automation of routine work and global off shoring. In contrast, polarized job - concentrated in high qualification (highly technical and managerial occupations), and low-wage employment (for example, catering and personal care) (David Autor, 2010).

3. Computational Thinking. The ability to handle the ever-increasing flows of information, using computational skills, modelling and programming at the same time aware of the limitations of any models and retain the ability to act in the absence of data.

4. Design Mindset. Design-oriented thinking is the ability to assess the availability of resources, including time, to achieve a result. Communication and innovation capacity of the computing world will bring new opportunities for the organization of a special approach to the work, such as the ability to schedule workflow and the formation of the working environment in such a way that will most likely achieve the most desirable results. Future specialists must acquire skill in recognizing the kind of thinking that will be required to perform the tasks of various types, and through changes in the working environment, to increase their own ability to perform these tasks.

5. Cognitive Load Management. Due to the density and richness of information flows, falling on the users of various electronic devices, comes to the fore the problem of cognitive overload. The only way to preserve the effectiveness of this process - quickly isolate and filter information important. Professionals need to develop their own skills to deal with the onslaught of information, for example, social ranking, tagging, adding other metadata to the content of information helps reduce "noise."

6. Social Intelligence. Employees with a high level of social intelligence - the ability to correctly assess the behavioural responses of individuals - able to quickly assess the emotions and adapt their behaviour according to the verbal and non-verbal cues of others. It continues to remain a key skill for professionals in the area of competencies which include cooperation and the formation of a trusting relationship, and probably still quite a long period of time remains a comparative advantage to the human machine.

7. Cross Cultural Competency. In view of the real nature of the global interconnectedness of the world, the globalization of labour markets need to be able to work in any environment, where they can be claimed. And here we are talking not only about the availability of suitable linguistic skills as the ability to recognize and accept cultural differences. Cross-cultural competence become relevant not only for specialists, changing location. Currently, diversity is seen as a driving force of innovation. According to the research, the team success and progress in its work depends on the differences of team members equally (age, skills, work style and way of thinking) and on the individual level of their intelligence (Yannis M. Ioannides, 2010). Therefore, diversity in teams will acquire the status of a key competence for organizations over the next decade.

8. New Media Literacy. This skill involves the ability to develop content through new media, including blogs, podcasts, and videos, as well as creating their own visual information using word processing software, previously available only to a limited number of print designers. Visually stimulating, persuasive communication is becoming

the norm, as is the use of new tools to attract and beliefs of the audience.

9. Transdisciplinarity. This skill implies a deeper understanding of the ability, at least one discipline with the simultaneous interaction potential in languages over a wide range of disciplines. The need to develop this skill came with the emergence of global problems (e.g. overcrowding), approaches to the study of which cannot be formed within the same domain. Such tasks require interdisciplinary solutions, so the focus away from a deep specialization in Transdisciplinarity approaches to education; by combining researchers from different disciplines to work in interdisciplinary teams to the education of researchers who have mastered several disciplines (e.g. mathematics and biology).

10. Virtual Collaboration. Modern high technologies have formed the development potential of a virtual working environment for teams, providing opportunities to work together, exchange ideas and maintain the productivity of the participants, despite their territorial fragmentation. Work performed in a virtual environment requires specific management skills of the team leader, who must be able to develop strategies and tools for effective work and motivation of its members.

Note that currently bypasses the middle of the decade, after which the previously described trends are likely to show up in full. Moreover, now they be.g.in their studies in institutions of higher education experts, which will be released in the labour market in 2020. The question regarding the training on the changes taking place adequate level professionals, is still acute in Russia. At the same time, the country at the appropriate level focuses on the changes occurring in the world, as evidenced by the international project Global Education Future. The experts discussed technological change, social and economic processes affecting the structure of work tasks, building industry "map of the future", by which the identified demand for new competencies and build the image of the new professions. The result of the study was the launch of the first experimental version of the "Atlas of the new professions" in which the authors highlighted the promising sectors and professions over the next 15-20 years.

3. ATLAS OF NEW PROFESSIONS

The Atlas (Atlas of new professions, 2014) consists of two parts, the first of which is devoted to new skills, which will arise in upcoming years at the most promising high-tech and fast-growing sectors of the Russian economy; the second part is devoted to the "professions-pensioners", "aging" which occurs gradually, but eventually their transformation or withdrawal from the market is inevitable. In the first group of professions specified prospective horizon occurrence - before or after 2020. After 2020, with a favourable technological development of the country and the world any profession who are new not only for Russia but also for other countries. For each industry section provides a brief forecast of its development until 2030, with an indication of the new technologies and trends, which are estimated by industry experts and employers as the most interesting and promising. For each sector, a list of new professions with a brief description of their work tasks. For each type of profession selected specialization (cross-industry or intra-industry). In terms of sectors represented domestic Russian universities, where you can get basic training in future professions, and the largest employers in the Russian market.

The Atlas of new professions presents a list of professional skills that are universal and important for specialists in various sectors, mastery of which will allow workers to increase the effectiveness of professional activity in the industry, as well as providing an opportunity to move between sectors, while maintaining its relevance:

- Systems thinking - the ability to define complex systems and to work with them, including Systems Engineering.
- Interdisciplinary Communication - understanding of technologies, processes and the market situation in different adjacent and non-adjacent areas.
- Project management - ability to manage projects and processes.
- Programming IT solutions, management of complex automated complexes, work with artificial intelligence.
- Client orientation - ability to work with the demands of the consumer.
- Multilingual and multicultural - fluent English and a second language, understanding of national and cultural context of the partner countries, an understanding of the specifics of work in industries in other countries.
- Work with people - the ability to work with teams, groups and individuals.
- Work in a mode of high uncertainty and rapid change in the conditions of problems - the ability to make decisions quickly, respond to changing operating conditions, the ability to allocate resources, and manage your time.
- Skills artistic creativity - ability to art, a developed aesthetic taste.
- Lean Manufacturing.

According to the Atlas of the authors, significant changes in the traditionally extremely conservative education initiated by the spread of new information and communication technologies, which are, firstly, replace the traditional tools of training on IT tools (online courses, simulations, simulators, games online worlds, etc.), which, in turn, develops cognitive skills and contributes to the development of the productive states of consciousness. Second, the information technology "individualize" education, and adjusting the content of the learning process for requests and the individual characteristics of the student (learning rate, a preference forms of education, and others.). Thirdly, IT tools allow you to implement the game forms of training to help better develop the subjects taught. Fourth, education is focused on real projects of students, including their start-ups. As a key trend can be called a continuity of education as an accompanying person during the whole process of life.

Among the new professions in the field of education, according to the authors of the Atlas, to 2020 may appear:

• Moderator - specialist in organizing group discussions or issues of collective creative work with the students to ensure the absorption of new material in practice;

• Tutor - teacher accompanying the individual development of students in the disciplines that form the education program, worked out individual assignments, recommending a career path development;

• Organizer of the project-based learning - a specialist in the formation and organization of educational programs, the center of which is the preparation and implementation of projects in the real sector of the economy or social sphere, and the study of theoretical material is required to support the activities.

• Coordinator of educational online platform - a specialist in educational institutions or independent educational project, which has expertise in online pedagogy and accompanying training online courses on specific subjects (disciplines), organizes and promotes specific courses or types of educational trajectories, moderated chat teachers and students in courses or platforms, specifies the requirements for the finalization of the platform functionality;

• Start-up mentor - a professional with experience in the implementation of his own start-up projects, supervising teams of new start-ups, training doing business in the practice of their own projects.

Among the new professions in the field of education after 2020 are likely to appear:

• Developer of educational paths - professional, creating a "route" training of new professionals from the courses offered by educational institutions, including those available online, as well as trainers, simulators, training, etc., on their basis to develop educational track, taking into account psycho, abilities and. the objectives of the individual;

• Coach of the Mind-Fitness - a specialist who develops a program of individual cognitive skills (such as memory, attention, concentration, speed reading, an oral account, etc..) With the help of special programs and devices allowing for the psycho, and needs;

• Developer of learning tools dedicated to the states of consciousness - creates hardware and software (eg, biofeedback devices) to train users productive states of consciousness (a high concentration, relaxation, enhanced creativity, etc.).

Lecturers are mentioned in the Atlas as the aging in the foreseeable future profession, directly related to the education system. Thanks to the development of educational technology and change requests of students, number of tasks teachers loudspeakers will change, and writing the standard lecture course dictation is transformed into a search for information on the web as the leading universities of the world offer a variety of free and paid certification online courses for everyone. As a result, the task of lecturers will be broadcast students unique knowledge and experience, which can not be obtained in another way.

Labour market for professionals in the field of education in Russia are the school or university system, most of which are public institutions. However, an increasing number of Russian corporations for their employees creates its own training centres or corporate universities. New education formats appear mainly in secondary education, including IT companies developing simulators and game programs for training.

The global educational trends, transforming the familiar for the workforce environment, are a kind of context, which defines the content occurring at both the global level and in the national system of vocational education changes. Judging by the content and direction occurring currently in the system of higher education transformation, in Russia attempts to join the proceeding processes, to restore the status of one of the most educated nations of the world and take their rightful place international division of labour. It is clear that to carry out this qualitative leap is not easy, it will take time and a considerable amount of effort, given the current economic situation, the level of international competitiveness and export raw status of the Russian economy. Thus, the objective criterion of the effectiveness of our education system is necessary to consider the position of the country in the international division of labour.

4. DYNAMIC OF EDUCATION IN RUSSIA

Despite extensive discussion on the possibility of the country's transition to an innovative model of economic development in Russia is still a small number of companies are implementing various innovations. At least six times fewer companies than in Germany, and 5.5 times less than Brazil (OECD Economic Survey, 2014). In terms of exports Russian Federation technology lags behind Germany 87 times, from the UK - 70 times, from Sweden - 30 times, Finland - 15 times (Indicators of innovative activity, 2014). Lean export of technology shows the degradation of the scientific sphere and underdeveloped countries of the innovation system.

In the ranking of the Global Innovation Index (Global Innovation Index - GII), which is carried out payment in 2007. In 2014 Russia ranked 49th place (39.14 points), located between Thailand and Greece (The Global Innovation Index, 2014). Traditionally, Switzerland being a leader of the rating, in 2014 took the first place (64.8 points), followed by the UK, Sweden, Finland, Netherlands, USA and Singapore (59.2 points). Despite the fact that in the ranking system the position of Russia raised to several positions, the international assessment of the level of innovative development of the country over the last seven years remained almost unchanged. But it is necessary to highlight that over the period of 2011-2014 Russian GII grew by more than 3 points.

Fig. 2 shows the dynamics of the structure of state and non-state educational institutions by level of professional education, since 1990. It is obvious that since the 1990s a significant reduction in the release of skilled workers and employees took place. From the middle of 1990s until 2013 the hypertrophic growth of graduates with higher education

was observed every year time period. In 1990, graduates with secondary and primary education was 4.76 times more than graduates of higher education, in 2013, graduates with degrees in 1.48 times more than graduates with secondary and primary vocational education.

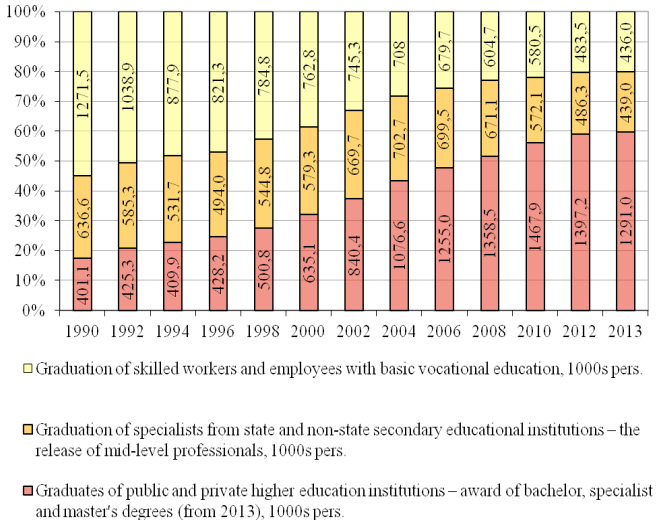

Fig. 2.Dynamics if of public and private educational institutions product mix by level of professional education for the period 1990-2013

Let us follow the changes in the structure of graduates with higher education in Russia in the period 1990-2013 (Table 1). In 2003, it was approved by the new National Classification of special education, according to which the Federal State Statistics Service produced a set of statistics on graduates of higher education institutions from 2004 to the present time. To illustrate the dynamics of state and non-state higher education institutions issue structure, since 1990 (Fig. 3), was produced regrouping data on groups of specialties.

Table 1 Graduates of state and municipal institutions of higher education (by groups of specialties) in 1990-2003.

Number of graduates	1990		1997		2003	
State and municipal institutions of higher education	thous. people	% of the total	thous. people	% of the total	thous. people	% of the total
Total,	401,1	100,0	406,2	100,0	797,2	100,0
Including: economics and management	55,5	13,84	78,3	19,28	248,2	31,13
Humanities and social	48,8	12,17	68,3	16,81	185,6	23,28
Education	41,3	10,30	37,1	9,13	57,5	7,21
Natural sciences	35,9	8,95	35,6	8,76	41,8	5,24
Agriculture and fisheries	29,7	7,40	21,6	5,32	30,2	3,79
Health	24,6	6,13	29,2	7,19	25,8	3,24
Construction and architecture	22,6	5,63	17,5	4,31	24,3	3,05
Interdisciplinary natural-technical professions	-	-	5,1	1,26	14,9	1,87
Culture and art	12,8	3,19	10,2	2,51	13,6	1,71
Engineering and material handling	14,0	3,49	10,4	2,56	13,5	1,69
Electronic engineering, radio engineering and communications	14,2	3,54	10,9	2,68	12,9	1,62
Computer Science and Engineering	7,1	1,77	8,7	2,14	12,1	1,52
Processing machinery and equipment	10,0	2,49	8,8	2,17	11,8	1,48
Energy and power-plant	8,8	2,19	6,8	1,67	11,4	1,43
Automation and Control	10,8	2,69	8,4	2,07	11,1	1,39
Land vehicles	7,4	1,84	5,2	1,28	8,8	1,10
Transport operation	4,5	1,12	5,2	1,28	8,7	1,09
Technology of food products	8,5	2,12	4,2	1,03	7,3	0,92
Electrical engineering	2,8	0,70	4,5	1,11	6,8	0,85
Development of mineral resources	4,1	1,02	2,9	0,71	6,3	0,79
Chemical Technology	7,2	1,80	4,1	1,01	5,6	0,70
Technology Consumer Goods	8,9	2,22	4,1	1,01	4,2	0,53
Metallurgy	3,9	0,97	2,8	0,69	3,6	0,45
Instrumentation	3,9	0,97	3,0	0,74	3,6	0,45
Aviation, rocket and space technology	4,4	1,10	3,3	0,81	3,3	0,41
Geology and mineral exploration	2,9	0,72	1,5	0,37	1,9	0,24
Other specialties	6,5	1,62	8,5	2,09	22,4	2,81
Private educational institutions of higher education (since 1994)	1,9	100,0	10,4	100,0	89,2	100,0
Including: economics and management	1,2	63,16	5,2	50,0	46,2	51,79
Humanities and social	0,3	15,79	4,1	39,42	38,4	43,05
Other specialties	0,4	21,05	1,1	10,58	4,6	5,16

The number of graduates by specialty group "Chemical and Biotechnology" decreased from 10.7 thousand people in 2005 to 10.2 thousand people in 2013 and is only about one percent of the total output in state universities (Table 2). The professions related to medicine, the absolute number of graduates increased from 24.6 thousand people in 1990 to 36.0 thousand people in 2013, but their share in the total output of state universities has dropped by almost half over the entire period (and value was less than 3.5%). In the field of "Automation and Control" number of graduates increased from 10.8 thousand people in 1990 to 15.8 thousand people in 2013, but they accounted for slightly less than a half percent in total output (decreased almost by half).

Table 2 Issue of bachelor's, master's by institutions of higher education (by groups of specialties) in 2005-2013.

Issued bachelors, masters	2005		2009		2013	
State educational institutions of higher education	thous. people	% of the total	thous. people	% of the total	thous. people	% of the total
Total, including:	914,8	100,0	1083,1	100,0	1060,0	100,0
Economics and Management	292,7	32,00	374,9	34,61	350,5	33,07
Humanitarian sciences	145,1	15,86	178,8	16,51	177,2	16,72
Education and pedagogy	129,0	14,10	123,3	11,38	102,6	9,68
Architecture and construction	29,4	3,21	37,8	3,49	42,9	4,05
Health	28,2	3,08	33,0	3,05	36,0	3,40
Agriculture and fisheries	34,8	3,80	36,3	3,35	35,2	3,32
Transportation	29,4	3,21	34,2	3,16	34,0	3,21
Energy, power-plant engineering, electrical engineering	22,0	2,40	24,3	2,24	28,0	2,64
Computer Science and Engineering	17,7	1,93	22,6	2,09	25,7	2,42
Metallurgy, material handling	25,8	2,82	25,6	2,36	23,1	2,18
Culture and art	16,4	1,79	18,2	1,68	20,6	1,94
Geology, exploration, development of mineral resources	11,3	1,24	13,9	1,28	16,8	1,58
Service sector	6,3	0,69	13,5	1,25	16,2	1,53
Natural Sciences	13,7	1,50	13,7	1,26	16,1	1,52
Automation and Control	11,4	1,25	14,7	1,36	15,8	1,49
Physical-mathematical sciences	11,8	1,29	10,8	1,00	15,7	1,48
Social sciences	11,2	1,22	16,6	1,53	15,4	1,45
Electronic engineering, radio engineering and communications	15,1	1,65	15,5	1,43	15,3	1,44
Technology of food products and consumer goods	17,5	1,91	19,8	1,83	15,2	1,43
BC, nature-improvement,	8,8	0,96	12,6	1,16	14,0	1,32

environmental protection						
Chemical and biotechnology	10,7	1,17	11,2	1,03	10,2	0,96
Instrument and optical engineering	7,1	0,78	7,7	0,71	7,6	0,72
Surveying and land management	3,4	0,37	4,7	0,43	7,0	0,66
Reproduction and processing of forest resources	5,9	0,64	6,3	0,58	6,4	0,60
Aviation, rocket and space technology	4,8	0,52	5,4	0,50	5,1	0,48
Marine engineering	3,4	0,37	4,1	0,38	3,6	0,34
Information Security	1,3	0,14	3,3	0,30	3,4	0,32
Weapons and weapons systems	0,6	0,07	0,6	0,06	0,4	0,04
Non-state higher education institutions, all	142,1	100,0	213,3	100,0	231,0	100,0
Including: economics and management	77,0	54,18	129,7	60,81	134,8	58,35
Humanitarian sciences	55,7	39,20	67,7	31,74	77,2	33,42
Other specialties	9,4	6,62	15,9	7,45	19,0	8,23

Analysis of these data makes it possible to see the formed imbalance in the structure of the issue of professional staff, characterized by a critical shift in the balance towards the Humanities and Social Sciences. If in 1990 the specialty of Economics and Management, Humanities and Social and Natural Sciences specialties occupied about 14, 12 and 9%, respectively, in the structure of state universities, in 2013, Economics and Management accounted for 33% of the issue, on Humanitarian and Social Sciences - 18%, and Natural and Physical and Mathematical Sciences - only 3%.

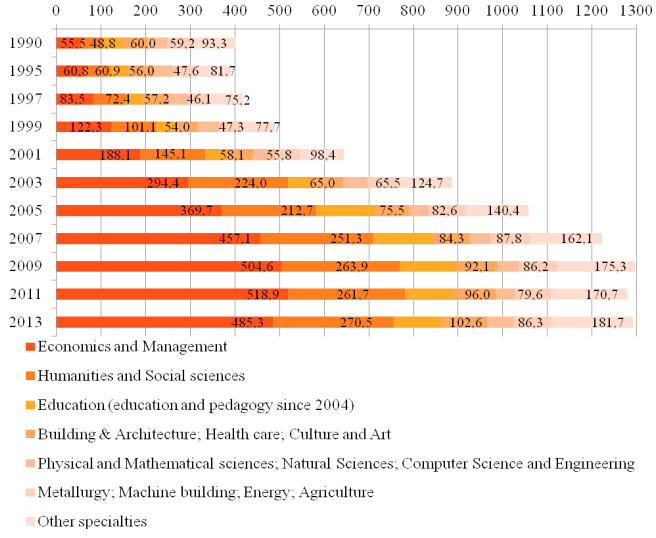

Fig. 3. Dynamics of state structures and non-release of the higher education institutions in generalized groups of specialties for the period 1990-2013

Taking into account the issue of private universities the picture becomes even more depressing. So, in 2013, 485.3 thousand people received diplomas of higher education on related specialties of Economics and Management, which is more than 37% of all issued in the country specialists. 270.5 thousand people were experts in the field of Humanities and Social Sciences (21% of total output), just 86.3 thousand people had a profession associated with Metallurgy, Material Handling, Mechanical Engineering, Power Engineering, Electrical Engineering and Agriculture (6.7%), and only 57.9 thousand. people received professional education in the field of Physical, Mathematical and Natural Sciences, Computer Science and Engineering (4.5%). These data show that the graduates for key groups of specialties, which are the engine of technological progress and on which depends the possibility of country's economy industrialization over the past twenty years, has fallen to a critical minimum.

Five of the 27 critical technologies associated with the group of specialties "Power, power-plant engineering, electrical engineering" - is the basic technology of power electronics; nuclear energy technology, nuclear fuel cycle, safe management of radioactive waste and spent nuclear fuel; new technologies and renewable sources of energy, including hydrogen energy; technology of energy-efficient transport systems, energy distribution and use; energy-efficient technologies of production and conversion of energy to fossil fuel. The number of graduates in this specialty group increased from 11.6 thousand. people in 1990 to 28.0 thousand. people in 2013. These data allow us to see the formed imbalance in the structure of manufacture of professional staff, characterized by an imbalance output structure by level of professional education, as well as a critical shift in the balance of the structure of graduates with higher education in the direction of the humanities and social sciences. Weak educational institutions focus on the actual needs of the national economy reduces the efficiency of the entire national system of vocational education.

5. CONCLUSIONS

Among the main problems, indicating the growing pace of reducing the vocational education system in Russia effectiveness, we can list the following:

1. Weak orientation of the education system to the actual needs of the national economy, which resulted in an imbalance of graduates of educational institutions with respect to the structure of the labour market needs. Currently, there are labour market glut of specialists with higher education and a shortage of specialists with specialized secondary professional education; oversupply of graduates with a liberal arts education and the lack of specialists trained in the natural sciences and technical disciplines.

2. Weak orientation of the education system to the global trend of labour market changes (absence of a system of training specialists with related competencies, as well as teaching staff, necessary for the preparation of appropriately qualified engineers).

3. Reduction of the quality of training of working professions. About the discrepancy of quality of training of workers actual needs of industry evidenced by the numerous initiatives of large domestic companies in the organization of targeted training of specialists according to their own staffing needs, as well as the persistently low level of competitiveness of the Russian teams in international competitions in manufacturing skills.

4. Low level of educational mobility programs, which is reflected in the backlog of the update process of educational programs on the processes of technological innovation in production.

Thus, the problem of reducing the efficiency of the education system today should not be viewed as the current difficulties, but as a systemic problem, which is related to both the infringement of the national vocational education system focus on the training of specialists in priority for the economic development function, as well as the specifics of the global labour market changes.

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REFERENCES

Ane B.K., Tarasyev A.M., Watanabe C. (2007). Construction of Nonlinear Stabilizer for Trajectories of Economic Growth. *Journal of Optimization Theory and Applications*, Vol.134(2), pp. 303-320.

Aseev S.M., Kryazhimskiy A.V. (2007). The Pontryagin maximum principle and optimal economic growth. *Proceedings of the Steklov Mathematical Institute*, Vol.257, pp. 5-271.

Atlas of new professions. Agency for Strategic Initiatives - an LNA "Skolkovo". Moscow. 2014. // URL.: http://www.skolkovo.ru/public/media/documents/research/sedec/SKOLKOVO_SEDeC_Atlas.pdf

David Autor. (2010) The Polarization of Job Opportunities in the US Labor Market. Center for American Progress and The Hamilton Project, April 2010. URL.: http://economics.mit.edu/files/5554

Future Work Skills 2020 Report [SR-1382A] (2011) // Institute for the Future. URL: http://www.iftf.org/uploads/media/SR-1382A_UPRI_future_work_skills_sm.pdf

Future Work Skills 2020 Summary Map (2011) // Institute for the Future. URL: http://www.iftf.org/uploads/media/IFTF_FutureWorkSkillsSummary_01.gif

Gurban I. A., Klevakin A.N. (2013). Assessment of socioeconomic consequences of drug abuse in the Ural federal district. *Economy of Region*, Vol.2, pp. 34-42.

Gurban I.A., Klevakin A.N. (2014). Distinctive Features of the Market of Drugs in Russia. *SGEM International Multidisciplinary Scientific Conferences on Social Sciences and Arts*, 3-9 September 2014, Bulgaria, Vol.4, pp. 209-216.

Gurban I.A., Sudakova A.E. (2015). An Assessment Methodology for the Development of Higher Education in Russia. *Mediterranean Journal of Social Sciences*, Vol. 6(5), 197-210.

Gurban I.A., Sudakova A.E. (2015). The Development of Higher Education in Russia: An Assessment Methodology. *Procedia - Social and Behavioral Sciences*, Vol.214, pp. 569-605.

Indicators of innovative activity: 2014 M .: Higher School of Economics, 2014. pp 455-457.

Klaassen G., Kryazhimskii A.V., Tarasyev A.M. (2004). Multiequilibrium game of timing and competition of gas pipeline projects. *Journal of Optimization Theory and Applications*, Vol.120(1), pp.147-179.

Koksharov V.A. (2014). Development dynamics of the higher education system in Russia, *Economy of Region*, Vol.4, pp. 31-44.

Koksharov, V.A., Agarkov, G.A. (2015). Analysis of economic motivation when individuals choose an educational path. *Economy of Region*, Vol.1, pp. 245-252.

Krasovskii A.A., Tarasyev A.M. (2008). Properties of Hamiltonian systems in the Pontryagin maximum principle for economic growth problems. *Proceedings of the Steklov Institute of Mathematics*, Vol.262(1), pp.121-138.

Kuklin A. A., Naydenov A. S., Nikulina N. L., Tarasyeva T. V. (2014). Transformation of theoretical-methodological approaches and methodical tools of the individual and territory welfare diagnostics. Part 1. From spreading to the alternative diagnostics approaches (background). *Economy of Region*, Vol.3, pp. 22-36.

Lambertini L., Tampieri A. (2015). Incentives, performance and desirability of socially responsible firms in a Cournot oligopoly. *Economic Modelling*, Vol.50, pp. 40–48.

Lutz W., Crespo Cuaresma, J., Sanderson, W. (2008). The demography of educational attainment and economic growth. *Science*, Vol.319, pp. 1047-1048.

Naydenov A.S., Krivenko I.A. (2013). Shadow economy in the context of economic crisis: Circumstance analysis and the forecasting of consequences. *Economy of Region*, Vol.1 (33), pp. 46-53.

Nikonov O.I., Tarasyev A.A. (2015). Dynamic Modeling of Multi-Regional Migration Processes: Ural Federal District Case Study. *IFAC Proceedings Volumes (IFAC-PapersOnline)*. 48 (25), pp. 45-49

OECD Economic Survey. Russian Federation. January 2014 Key findings and recommendations. URL: http://www.oecd.org/eco/surveys/Overview_RUSSIARus_2013.pdf

Sanderson W., Tarasyev A.M., Usova A. (2015). Optimal Two Sector Growth Models with Three Factors. *Review of Development Economics*, Vol.19(1), pp. 85-99.

Tarasyev A.A. (2013). Construction of the migration flows forecasting into Russian regions. *Economy of Region*, Vol.2, pp. 192-199.

The Global Innovation Index 2014 / URL: https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2014-v5.pdf

Vasilyeva A.V., Tarasyev A.A. (2014). Future development of migration processes and labour market in the regions of Russia. *Economy of Region*, Vol.4, pp. 283-298.

Yannis M. Ioannides. (2010) A Review of Scott E. Page's The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies // *Journal of Economic Literature*. Mar 2010, Vol. 48, No. 1: Pages 108-122.